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DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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March 15, 1990

TO: Minerals File

FROM: Holland Shepherd, Reclamation Specialist *HWS*

RE: Meeting with Hecla Mining, Tailings Pond Reclamation, M/021/004, Iron County, Utah

On February 27, 1990, the Minerals staff met with Mr. Bryan Johnson and Mr. Brent Willoughby of Hecla Mining. Also present were Mr. Mac Crofts and Mr. Lyle Stott of the Bureau of Water Pollution Control (BWPC). The meeting was held at the Division to discuss the reclamation of Hecla's Escalante Silver Mine's tailings pond.

Hecla had originally proposed to cover the tailings pond with a thin veneer of waste rock and topsoil, 6 inches and 3-4 inches respectively. Because of concerns, based on the content of deleterious materials contained in the tailings material, the Division and the operator have agreed to take a different approach in the decommissioning and reclamation of the facility.

The operator suggested, at this meeting, to install a 6 inch clay cap over the tailings then cover it with approximately 1 foot of waste rock and topsoil. The clay cap may still be used; however, the depth of plant growth medium will have to be greater to support a permanent and viable cover. Review letters from the Bureau of Land Management and the Division of Wildlife Resources support this concept. A problem in the addition of more topsoil is the fact that the BLM has commented against "scalping" other material to increase the depth of cover on the pond.

During the meeting, the operator submitted a series of analyses performed on soils and waste materials associated with the tailings pond reclamation (see attached). The analyses must be evaluated further. However, a brief review has indicated that considerably high amounts of sodium exist in the tailings material making it phytotoxic to plants. This will require that the tailings material be isolated from plants. Plant root growth into the tailings materials must be taken into account and prevented in developing a reclamation plan.

The operator provided a tentative time table for pond reclamation:

<u>Activity</u>	<u>Date</u>
Shut down process	8-90
Construct underdrain	9-90
Leachate, capture and evaporation basin	
Earth moving and cap of tailings	6-91
Cap and grout underdrain	9-92
Bond release	12-94

The operator intends to capture leachate remaining in the pond for a two year period. The leachate will be placed in a large tank and allowed to evaporate. The residual will then be disposed of in an acceptable fashion.

The BWPC staff indicated they were concerned with ground water contamination and advised continuing the ground water monitoring via wells until 1995 instead of 1994. Mr. Willoughby mentioned that nine years of monitoring had already occurred and that it was probably sufficient. Mr. Crofts then suggested that the operator provide the calculations supporting the earlier capping date.

The suggestion was made during this meeting by both BWPC and DOGM, that the operator consider covering the tailings with a breathable cap. In other words, don't use a clay cap. This would allow for a gradual neutralization and stabilization of the tailings material over time and would be less expensive for the operator. This would require, however, the construction of a capillary barrier between tailings material and topsoil material. In either case, clay cap or no clay cap, 3 - 4 feet of topsoil material will be needed to provide a good plant growth medium.

The Minerals staff will be evaluating the materials analyses provided by the operator, and consulting the literature to determine an acceptable course of reclamation to follow regarding the tailings pond. Our comments should be made to the operator as soon as possible. I'm not sure, at this time, if the Division will be waiting for comments from the BWPC before proceeding with ours.

jb

Attachment

cc: Wayne Hedberg
Tony Gallegos

A&L MID WEST LABORATORIES, INC.

13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770

REPORT NUMBER 9-180-1551/1555

June 29, 1989 M5



Hecla Mining Company #9595
P. O. Box 310
Enterprise, UT 84725

Subject: Coal & Overburden Analysis
Number of Samples: 5

Laboratory Number	11345	11346	11347	11348	11349
Sample Identification	#1	#2	#3	Top Soil	Waste Pile
pH	9.8	9.5	9.7	8.2	8.3
Total Sulfur (S) %	0.29	0.21	0.33	0.04	0.14
Potential Acidity (Maximum) *	9.1	6.6	10.3	1.3	4.4
Pyritic Sulfur (S) %	0.04	0.02	0.01	0.02	< 0.01
Potential Acidity (Actual) *	1.2	< 1.0	< 1.0	< 1.0	< 1.0
Neutralization Potential *	163	151	157	58	116
Acid-Base Potential					
CaCO ₃ Excess * (+)	162	151	157	88	116
CaCO ₃ Deficiency * (-)					
Potentially Acid/Toxic**	No	No	No	No	No
Other:					
Water Soluble Calcium (Ca) ppm	9	17	14	64	150
Water Soluble Magnesium (Mg) ppm	1	2	1	10	19
Water Soluble Sodium (Na) ppm	420	1830	1630	51	53
Sodium Absorption Ratio (SAR)	35.4	111.8	113.2	1.6	1.1
Sulfate Sulfur SO ₄ -S (%)	0.07	0.06	0.10	0.01	0.08

* Tons CaCO₃ equivalent per 1,000 tons of material.

** pH less than 4.0 or acid-base potential deficiency greater than 5.0 tons

CaCO₃ equivalent per 1,000 tons of material. Indicate yes or no

< Less than

Dedicated Exclusively to Providing Quality Analytical Services

John Torpy Laboratory Supervisor

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13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770



REPORT NUMBER: 9-180-1554
(Corrected Report 7-27-89)

June 29, 1989 (m5)

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

SUBJECT: ENVIRONMENTAL ANALYSIS

PO#: EM44288
Date Received: 6-15-89

Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11348	Top Soil	Total Cyanide Total Aluminum Total Arsenic Total Barium Total Cadmium Total Chromium Total Copper Total Iron Total Lead Total Manganese Total Mercury Total Molybdenum Total Nickel Total Silver Total Titanium Total Zinc Total Solids Extractable Selenium by AB-DTPA	< 0.2 mg/kg 18,724 mg/kg < 5.00 mg/kg 244 mg/kg < 0.5 mg/kg 15.2 mg/kg < 1.00 mg/kg 16,418 mg/kg < 5.00 mg/kg 634 mg/kg 0.06 mg/kg < 1.00 mg/kg 12.0 mg/kg < 1.00 mg/kg 1,650 mg/kg 76.1 mg/kg 97.7% 0.09 mg/kg	0.2 mg/kg 1.00 mg/kg 5.00 mg/kg 0.5 mg/kg 0.5 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 5.00 mg/kg 1.00 mg/kg 0.02 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 100 mg/kg 1.00 mg/kg 0.01% 0.05 mg/kg	EPA 9010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 7471 EPA 6010 EPA 6010 EPA 6010 Flame AA EPA 6010 SM 209F SM 303E

Note: < = Less than

Respectfully submitted,

John Torpy
John Torpy

Laboratory Supervisor
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REPORT NUMBER: 9-180-1555

June 29, 1989 (m5)

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

SUBJECT: ENVIRONMENTAL ANALYSIS

PO#: EM44288
Date Received: 6-15-89

Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11349	Waste Pile	Total Cyanide	< 0.2 mg/kg	0.2 mg/kg	EPA 9010
		Total Aluminum	12,970 mg/kg	1.00 mg/kg	EPA 6010
		Total Arsenic	179 mg/kg	5.00 mg/kg	EPA 6010
		Total Barium	1,404 mg/kg	0.5 mg/kg	EPA 6010
		Total Cadmium	20.8 mg/kg	0.5 mg/kg	EPA 6010
		Total Chromium	3.36 mg/kg	1.00 mg/kg	EPA 6010
		Total Copper	233 mg/kg	1.00 mg/kg	EPA 6010
		Total Iron	986 mg/kg	1.00 mg/kg	EPA 6010
		Total Lead	2,754 mg/kg	5.00 mg/kg	EPA 6010
		Total Manganese	1,162 mg/kg	1.00 mg/kg	EPA 6010
		Total Mercury	0.18 mg/kg	0.02 mg/kg	EPA 7471
		Total Molybdenum	< 1.00 mg/kg	1.00 mg/kg	EPA 6010
		Total Nickel	5.16 mg/kg	1.00 mg/kg	EPA 6010
		Total Silver	19.6 mg/kg	1.00 mg/kg	EPA 6010
		Total Titanium	468 mg/kg	100 mg/kg	Flame AA
		Total Zinc	2,905 mg/kg	1.00 mg/kg	EPA 6010
		Total Solids	99.8%	0.01%	SM 209F
		Extractable Selenium by AB-DTPA	0.08 mg/kg	0.05 mg/kg	SM 303E

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John Torpy
John Torpy
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REPORT NUMBER: 9-180-1551

June 29, 1989 (m5)

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

SUBJECT: ENVIRONMENTAL ANALYSIS

PO#: EM44288
Date Received: 6-15-89

Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11345	#1	Total Cyanide Total Aluminum Total Arsenic Total Barium Total Cadmium Total Chromium Total Copper Total Iron Total Lead Total Manganese Total Mercury Total Molybdenum Total Nickel Total Silver Total Titanium Total Zinc Total Solids Extractable Selenium by AB-DTPA	36.20 mg/kg 12,787 mg/kg 139 mg/kg 10,087 mg/kg 264 mg/kg 229 mg/kg 413 mg/kg 15,057 mg/kg 3499 mg/kg 1783 mg/kg 0.40 mg/kg < 1.00 mg/kg 10.9 mg/kg 23.3 mg/kg 975 mg/kg 5503 mg/kg 87.2%	0.2 mg/kg 1.00 mg/kg 5.00 mg/kg 0.5 mg/kg 0.5 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 5.00 mg/kg 1.00 mg/kg 0.02 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 100 mg/kg 1.00 mg/kg 0.01%	EPA 9010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 7471 EPA 6010 EPA 6010 EPA 6010 Flame AA EPA 6010 SM 209F SM 303E

Note: < = Less than

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John Torpy
Laboratory Supervisor
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13611 "B" STREET • OMAHA, NE 68144 • (402) 334-7770



REPORT NUMBER: 9-180-1552

June 29, 1989 (m5)

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

SUBJECT: ENVIRONMENTAL ANALYSIS

PO#: EM44288
Date Received: 6-15-89

Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11346	#2	Total Cyanide Total Aluminum Total Arsenic Total Barium Total Cadmium Total Chromium Total Copper Total Iron Total Lead Total Manganese Total Mercury Total Molybdenum Total Nickel Total Silver Total Titanium Total Zinc Total Solids Extractable Selenium by AB-DTPA	116.9 mg/kg 15,148 mg/kg 288 mg/kg 6,907 mg/kg 40.7 mg/kg 17.2 mg/kg 623 mg/kg 12,273 mg/kg 6,425 mg/kg 1,466 mg/kg 0.39 mg/kg < 1.00 mg/kg 560 mg/kg 61.9 mg/kg 759 mg/kg 8,132 mg/kg 88.3% < 0.05 mg/kg	0.2 mg/kg 1.00 mg/kg 5.00 mg/kg 0.5 mg/kg 0.5 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 5.00 mg/kg 1.00 mg/kg 0.02 mg/kg 1.00 mg/kg 1.00 mg/kg 1.00 mg/kg 100 mg/kg 1.00 mg/kg 0.01% 0.05 mg/kg	EPA 9010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 6010 EPA 7471 EPA 6010 EPA 6010 EPA 6010 Flame AA EPA 6010 SM 209F SM 303E

Note: < = Less than

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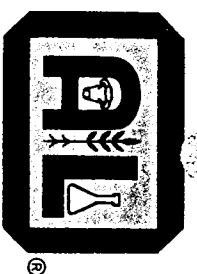
John Torpy
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Laboratory Supervisor

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REPORT NUMBER: 9-180-1553
(Corrected Report 7-26-89)

Hecla Mining Company #9595
Box 310
Enterprise, UT 84725

June 29, 1989 (m5)

SUBJECT: ENVIRONMENTAL ANALYSIS

PO#: EM44288
Date Received: 6-15-89

Laboratory Number	Sample Identification	Analysis	Level Found	Detection Limit	Method
11347	#3	Total Cyanide	83.9 mg/kg	0.2 mg/kg	EPA 9010
		Total Aluminum	11,849 mg/kg	1.00 mg/kg	EPA 6010
		Total Arsenic	169 mg/kg	5.00 mg/kg	EPA 6010
		Total Barium	6,709 mg/kg	0.5 mg/kg	EPA 6010
		Total Cadmium	32.4 mg/kg	0.5 mg/kg	EPA 6010
		Total Chromium	15.4 mg/kg	1.00 mg/kg	EPA 6010
		Total Copper	593 mg/kg	1.00 mg/kg	EPA 6010
		Total Iron	9,942 mg/kg	1.00 mg/kg	EPA 6010
		Total Lead	5,150 mg/kg	5.00 mg/kg	EPA 6010
		Total Manganese	2,185 mg/kg	1.00 mg/kg	EPA 6010
		Total Mercury	0.40 mg/kg	0.02 mg/kg	EPA 7471
		Total Molybdenum	< 1.00 mg/kg	1.00 mg/kg	EPA 6010
		Total Nickel	4.74 mg/kg	1.00 mg/kg	EPA 6010
		Total Silver	10.7 mg/kg	1.00 mg/kg	EPA 6010
		Total Titanium	556 mg/kg	100 mg/kg	Flame AA
		Total Zinc	6,934 mg/kg	1.00 mg/kg	EPA 6010
		Total Solids	86.3%	0.01%	SM 209F
		Extractable Selenium by AB-DTPA	< 0.05 mg/kg	0.05 mg/kg	SM 303E

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METHODS OF ANALYSES FOR MINE SPOILS

ANALYSIS	METHOD DESCRIPTION	METHOD REFERENCE
1. PH	1:1 Water pH Meter	NCR page 17-18
2. Conductivity	Saturated Paste Beckman Solu-bridge	USDA Handbook 60, Method (3a), page 84 and Method (4b), page 89
3. Soluble Ca, Mg, K, Na	Saturated Paste ICAP Jarrell-Ash Model 1100	USDA Handbook 60, Method (3a), page 84, Analysis by ICAP
4. Sodium Adsorp- tion Ratio	Saturated Paste	Calculation from: USDA Handbook 60, page 26
5. Pyritic sulfur Total sulfur	HCl extractable HNO ₃ extract- able and non-extractable Total Sulfur Fisher Model 472 Furnace Fisher Model 470 Sulfur Analyzer	EPA-600/2-78-054 field and laboratory methods applicable to overburdens and mine spoils Methods 3.2.6, page 60
6. Neutralization Potential	Titration	EPA-600-2-78-054 field and laboratory methods applicable to overburdens and mine spoils, method 3.2.3, page 47
7. Acid base Potential	Calculated	EPA-600-2-78-054 field and laboratory methods applicable to overburdens and mine spoils.
8. Sample preparation	Oven drying ground to pass 30 mesh	Oven drying at 37°C grinding to pass 30 mesh. Recommended soil test procedures for the North Central Dakota State University.

INFORMATION CAPSULES

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13611 "B" Street • Omaha, Nebraska 68144 • Phone: 402-334-7770

SOIL ANALYSIS METHODS

used by

A & L MID WEST AGRICULTURAL LABORATORIES, INC.

13611 B Street

Omaha, Nebraska 68144

<u>Analysis</u>	<u>Method</u>	<u>Reference</u>
1. Organic Matter	Chromic acid oxidation/ colorimetric	NCR, p. 30
2. Phosphorous a. P_1	Extraction w/dilute acid and ammonium fluoride (weak Bray)/ colorimetric	NCR, p. 14-15
b. P_2	Extraction with strong Bray solution (4 times the acid concentration of weak Bray)/colorimetric	
c. Bicarbonate P	Extraction with sodium bicarbonate/ colorimetric	ASA, p. 421-22
3. Potassium, Magnesium, Calcium, Sodium, Sulfur	Neutral ammonium acetate (1 N) extraction/Inductively Coupled Argon Plasma (ICAP) detection	RMST, p. 60-65 NCR, p. 17-18
4. pH Soil pH, Buffer index	1:1 Soil:Water mixture/combination electrode. Shoemaker, Melcan and Pratt (SMP) buffer/combination electrode	NCR, p. 5-8
5. Cation Exchange Capacity (CEC)	a. Summation of cations, Ca^{++} , Mg^{++} , K^+ , Na^+ , and H^+ (see 3 & 4) b. Ammonium acetate saturation/ displacement with NaCl/distillation and titration	ASA, p. 149-151
6. Nitrate-N	Saturated $CaSO_4$ extraction/specific ion electrode	ASA, p. 671
7. Ammonia-N, Exchange- able	Neutral salt KCl extraction/specific ion electrode	ASA, p. 648
8. Zinc, Manganese, Iron, Copper	a. DPTA extraction/ICAP detection b. 0.1 N HCl extraction ICAP det. (over)	NCR, p. 18-19 NCR, p. 19-20

PERCENT ORGANIC MATTER

An overnight digestion process that shows a level of humus and protein materials. The sample should contain a minimum of field residues visible to the eye. For herbicides, consider visible residues in addition to the % O.M. reading.

ESTIMATED NITROGEN RELEASE

Estimated nitrogen release from the O.M. to the next crop. It is used as an adjustment on nitrogen recommendations. The amount used varies by geographic area and Cation Exchange Capacity.

ppm $P_1 - P_2$

P_1 is the standard Bray phosphorus extraction showing the most readily available P on pH's 5.8 - 7.5.

P_2 is a stronger extraction which picks up phosphorus loosely held in O.M. and Ca-P reserves. The difference between P_1 and P_2 is considered active reserve.

SODIUM BICARBONATE

Sodium Bicarbonate is an extraction developed for calcareous soils with pH levels above neutral. This analysis should be requested on soils with a pH greater than 7.0

ppm K

Uses a standard ammonium acetate extraction with a five minute agitation time. We find that this procedure gives the most consistency over variations in environment wet to dry and frozen samples.

K-ratings (H M L) reflect the relative availability of K and are related to C.E.C.

K_2O recommendations will be increased on higher % Mg soils (23% Mg saturation and greater).

MAGNESIUM AND CALCIUM

Magnesium and Calcium concentrations are also determined by ammonium acetate extraction. These levels are primarily affected by soil type, drainage, liming, and cropping practices.

SOIL pH

Soil pH is the pH we use when referring to crop response (See Capsule #123) and general pH references. It relates to the concentration of hydrogen ions in the soil solution. More hydrogen relates to lower pH's or more acid soils.

Some sources of hydrogen are O.M. decomposition, root absorption of cations (K, Ca, Mg, etc.), leaching of calcium and magnesium and fertilizers containing ammonia, and ammonium sources of N.

BUFFER INDEX

Buffer pH is only used for lime recommendations. It is an index of the lime requirement which measures soil resistance to pH change. On soil reports, the millequivalents (meq) of hydrogen and % hydrogen reflect the hydrogen concentration related to buffer pH.

C.E.C.

C.E.C. is a soil's relative holding capacity for water, nutrients and chemicals. For a given area, the higher numbers are relatively heavier soils than small numbers (See Capsule #102). The concentration of cations or ppm or K, Ca, Mg, Na on Alkaline soils and hydrogen on buffer pH's 7.0 and less are used in the calculation.

PERCENT BASE SATURATION

The percent saturation of each cation element represents the proportion of that element within a given soil system. The percentage saturation for each of the following cations for optimum crop performance will generally be within the following ranges: Potassium 2-5%, Magnesium 12-18%, and Calcium 65-75%. It is not possible to create a perfect soil in the field. We can, however, use the information the laboratory can supply to make the proper decisions on the soil we have to work with. An example of this would be: as percent saturation Mg increases, several conditions are indicated which should be considered. (See Capsule #104).

ESTIMATING SOIL TEXTURES BY CATION EXCHANGE CAPACITY DETERMINATION

Soil Texture	C.E.C.
Clay	30-40
Silty Clay	22-32
Sandy Clay	15-30
Silty Clay Loam	18-30
Clay Loam	16-28
Silt	14-29
Silt Loam	15-20
Loam	13-18
Silt	10-15
Sandy Loam	8-12
Loamy Sand	5-8
Sand	3-5

The presence of free lime or calcium carbonate will increase the C.E.C. value obtained. Actual soil textures by hydrometer will give the most accurate determination.

To determine the tons of lime required, locate the % effective calcium carbonate which is available from the quarry and compare with the suggested lime recommendation that correlates with the proper Buffer pH. Lime rates will need to be adjusted based on the percent passing a 60 mesh sieve and the depth of incorporation. The lime recommendations are based on a six-inch incorporation. The rates should be reduced if incorporation is less than six inches or the lime is finely ground. Four tons per acre of a 90% lime is the recommended maximum rate for a single application. Six tons of a 90% lime is the maximum rate per season.

A & L RECOMMENDATION LBS. $CaCO_3/A$

Buffer Index	6.9	6.8	6.7	6.6	6.5	6.4	6.3	6.2
	900	1800	2700	3600	4500	5400	6300	7200
%								
E.C.C.								
100	0.45	0.9	1.3	1.8	2.3	2.7	3.15	3.6
95	0.47	0.95	1.4	1.9	2.4	2.8	3.3	3.8
90	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
85	0.52	1.05	1.6	2.1	2.6	3.1	3.7	4.2
80	0.56	1.1	1.7	2.3	2.8	3.3	3.9	4.5
75	0.6	1.2	1.8	2.4	3.0	3.8	4.2	4.8
70	0.64	1.3	1.9	2.5	3.2	3.8	4.5	5.1
65	0.69	1.4	2.0	2.7	3.4	4.1	4.8	5.5
60	0.75	1.5	2.3	3.0	3.7	4.5	5.2	6.0
55	0.21	1.5	2.5	3.3	4.0	4.9	5.7	6.5
50	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2
45	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

REPORT NUMBER

174-0116

REPORT DATE

06/29/89

ACCOUNT NO.

9595

GROWER

HECIA MINING COMPANY

A & L MID WEST LABORATORIES, INC.
13611 "B" Street • Omaha, Nebraska 68144-3693 • Phone: (402) 334-7770



TO:

HECIA MINING COMPANY
TANNY HARLIN
BOX 310
ENTERPRISE UT 84725

SUBMITTED BY:

SOIL ANALYSIS REPORT

(SEE EXPLANATION ON BACK)

INFO SHEET # 127797

SAMPLE NUMBER	LAB NUMBER	ORGANIC MATTER	PHOSPHORUS		BICARBONATE	POTASSIUM		MAGNESIUM		CALCIUM		SODIUM		SOIL pH	BUFFER INDEX	HYDRO-GEN	CATION EXCHANGE CAPACITY	PERCENT BASE SATURATION (COMPUTED)				
			P ₁ (WEAK BRAY)	P ₂ (STRONG BRAY)		K ₂ O	ppm	Mg	ppm	Ca	ppm	Na	ppm				meq/100g	% K	% Mg	% Ca	% H	% Na
1	34294	0.3VL	33	1VL	2VL	155VH	20VL	1425H	316VH	9.8	0.0	9.1	4.4	1.8	78.6	0.015.2						
2	34295	0.3VL	39	2VL	3VL	238VH	17VL	1400M	994VH	9.5	0.0	12.1	5.1	1.2	58.0	0.035.8						
3	34296	0.3VL	39	1VL	2VL	246VH	20VL	1412M	859VH	9.7	0.0	11.6	5.4	1.4	60.9	0.032.2						
TOP	34297	2.1M	71	21H	79VH	481VH	368VH	2801H	36	8.2	0.0	18.5	6.7	16.6	75.9	0.0	0.8					

DTPA EXTRACTION

SAMPLE NUMBER	NITRATE NO ₃ -N	SULFUR S	ZINC Zn	MANGANESE Mn	IRON Fe	COPPER Cu	BORON B	EXCESS AME RATE	SOLUBLE SALTS	% SAND	% SILT	% CLAY	SOIL TYPE
	ppm	RATE ppm	ppm	RATE ppm	ppm	RATE ppm	ppm	RATE ppm	mmoles/cm ³ RATE	%	%	%	
1	2VL						8.1VH	H	1.6L	14	78	8	SILT LOAM
2	2VL						8.0VH	H	3.7M	10	84	6	SILT
3	2VL						9VH	H	3.7M	10	82	8	SILT
TOP	2VL						1.8H	H	1.2L	38	46	16	LOAM

COMMENTS:

The sample identified as waste pile consisted entirely of particle sizes of cobbles and coarse gravel. This material was pulverized and analyzed for the parameters regulating total element content. It was not analyzed for extractable or exchangeable nutrients.

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

A & L MID WEST LABORATORIES, INC.

John Pohlman
John Pohlman/John Menghini
AL Rev 5.1 MG

CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), VERY HIGH (VH), AND NONE (N)
ENR - ESTIMATED NITROGEN RELEASE
MULTIPLY THE RESULTS IN ppm BY 2 TO CONVERT TO LBS. PER ACRE OF THE ELEMENTAL FORM

MULTIPLY THE RESULTS IN ppm BY 4.6 TO CONVERT TO LBS. PER ACRE P₂O₅
MULTIPLY THE RESULTS IN ppm BY 2.4 TO CONVERT TO LBS. PER ACRE K₂O
MOST SOILS WEIGH TWO (2) MILLION POUNDS (DRY WEIGHT) FOR AN ACRE OF SOIL 6-2/3 INCHES DEEP

16010439-5355 Zone 5